

Claims

1. A method of oxidising carbohydrates and/or carbohydrate derivatives having at least one primary alcohol group comprising contacting a reaction medium containing said carbohydrates and/or carbohydrate derivatives with a nitroxy radical mediator and a peroxidase enzyme, characterised in that the initial reaction medium contains at least 10% by weight carbohydrates and/or carbohydrate derivatives, in that the peroxidase enzyme is an oilseed peroxidase and in that a hydroperoxide and an alkali compound are gradually added to the reaction medium such that its pH is maintained at between 3.5 and 10.0.
2. A method according to claim 1, wherein the carbohydrates and/or carbohydrate derivatives are selected from the group consisting of starch, glucose, trehalose, maltooligosaccharides, isomalto-oligosaccharides, glucose syrups, maltodextrins, glycerol, sorbitol, and mixtures thereof.
3. A method for oxidising carbohydrates according to claim 1, wherein the pH is maintained between 3.5 and 8.0, preferably between 4.0 and 7.5.
4. A method for oxidising carbohydrate derivatives according to claim 1, wherein the pH is maintained between 5.0 and 10.0.
5. A method according to any one of the preceding claims, wherein the initial reaction medium contains at least 40% by weight carbohydrates and/or carbohydrate derivatives.
6. A method according to any one of the preceding claims, wherein at least 10% of the primary alcohol groups are oxidised.
7. A method according to claim 6, wherein at least 50% of the oxidised primary alcohol groups are oxidised to carboxyl groups.

8. A method according to any one of the proceeding claims, wherein the nitroxy radical mediator is a di-tert-nitroxyl compound, preferably selected from 2,2,6,6-tetramethylpiperidin-1-oxyl (TEMPO) and derivatives or mixtures thereof.
9. A method according to any one of the proceeding claims, wherein the initial reaction medium comprises a molar ratio of nitroxy radical mediators to primary alcohol groups of 1:4 to 1:150, preferably of 1:40 to 1:70.
10. A method according to any one of the proceeding claims, wherein the peroxidase enzyme is selected from the group consisting of: rapeseed peroxidase, palm oil peroxidase, groundnut peroxidase, soybean peroxidase and mixtures thereof.
11. A method according to any one of claims 1 to 8, wherein the peroxidase enzyme is soybean or palm oil peroxidase.
12. A method according to any one of the proceeding claims, wherein the initial reaction medium comprises 2000 to 540 000 Units of peroxidase enzyme, preferably approximately 5000 Units of peroxidase enzyme, per mole of primary alcohol.
13. A method according to any one of the proceeding claims, wherein the peroxidase enzyme is immobilised on a support.
14. A method according to any one of the proceeding claims, wherein, for each mole primary alcohol, 0.5 to 4 mmol/min hydroperoxide are added to the reaction medium.
15. A method according to any one of the proceeding claims, wherein the hydroperoxide is hydrogen peroxide or a source thereof.
16. A method according to any one of the proceeding claims, wherein, for each primary alcohol group, 0.1 to 1.1 mmol/min alkali compound is added to the reaction medium.

17. A method according to any one of the preceding claims, wherein the alkali compound is sodium hydroxide.

18. A method according to any one of the preceding claims, wherein the reaction medium is maintained at a temperature of between 20 and 50°C, preferably at about 25°C.

19. A method according to any one of the preceding claims, wherein the reaction time is from 20 to 55 hours, preferably 45 to 52 hours.

20. A process for producing gluconic and/or glucaric acid comprising oxidising glucose according to the method of any one of claims 1-3 or 5-19.

21. A process for producing oxidised trehalose comprising oxidising trehalose according to the method of any one of claims 1-3 or 5-19.

22. A process for producing D-glucuronolactone comprising:

- a) oxidising trehalose according to the method of any one of claims 1-3 or 5-19;
- b) optionally recovering the nitroxy radical mediator;
- c) hydrolysing the oxidised product of the reaction of step (a);
- d) lactonising the product of the hydrolysis reaction of step (c); and
- e) crystallising the product of step (d).

23. A process according to claim 22, wherein at least 15% of said trehalose is converted to D-glucuronolactone.

24. A process according to claim 22 or claim 23, wherein step (c) is carried out in the presence of sulphuric acid, HCl and/or a cation exchange resin.

25. A process according to claim 22 or claim 23, wherein step (c) is carried out in the presence of an *O*-glycosyl compound hydrolysing enzyme, preferably in the presence of exo-polygalacturonase.

26. A process according to claim 25 wherein the *O*-glycosyl compound hydrolysing enzyme is immobilised on a support.